PROJECT NUMBER: 1702
PROJECT TITLE: Optical Processing and Aerosol Research
PROJECT LEADER: K. A. Cox
PERIOD COVERED: July, 1988

I.   INDIVIDUAL CIGARETTE INSPECTION   (D. Lowitz)

     A.   Objective: Develop methods for the inspection of individual
          cigarettes on a making machine.

     B.   Results: Specifications for an acousto-optic (AO) scanning system
          to be used for individual cigarette inspection were determined.
          The calculations were carried out in collaboration with Professor
          A. Vanderlugt from N. C. State.

     C.   Plans: Implement a high speed system for the transfer and storage
          of data from the CIM test table.

II. OPTICAL PACK INSPECTION, THEORETICAL   (R. Maher, K. Cox)

     A.   Objective: Develop and test a discriminating filter for use in an
          optical pack inspection system.

     B.   Results: The SDF filter design algorithm was tested on a more
          extensive video image library. The library included 400 good
          images of Marlboro red soft packs, 300 with unacceptable side-to-
          side label registration, 400 with no closure stamps, and 400 with
          the closure stamp in the wrong location. All images were binary.
          A correlation filter was designed using 300 of the good images and
          was tested (numerically) on the remaining images. All images were
          correctly classified as acceptable or unacceptable.

     C.   Plans: Test a digital filter of similar design.

III. OPTICAL PACK INSPECTION, EXPERIMENTAL   (C. Harward, M. Mullins)

     A.   Objective: Evaluate the Global Holonetics SMART CAMERA.
          Determine its effectiveness in discriminating between good and
          defective packs.

     B.   Results: Further testing of the SMART CAMERA has been postponed
          until the thermally induced drift in the output can be reduced to
          an acceptable level.

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IV.   OPTICAL PACK INSPECTION, EXPERIMENTAL   (C. Harward, M. Mullins)

   A.   Objective: Construct and evaluate an optical correlator-based pack inspection system.

   B.   Results: A Vanderlugt type correlation filter was made from the image of an average good pack from the set described in II above. The filter was made using a photographic process and the system was evaluated using the other images from the set. The system was able to readily recognize side-to-side label misalignment and was able to recognize packs with the closure stamp in the wrong place with some reliability. The variation in the signal obtained from acceptable images was too large to permit reliable classification of packs with missing closure stamps. The latter limitation is expected from a Vanderlugt type filter. An SDF filter used in a similar inspection system is expected to yield superior performance.

   C.   Plans: Evaluate a similar system employing a computer generated SDF filter.

V.   AEROSOL RESEARCH   (T. Nguyen)

   A.   Objective: Develop a laboratory aerosol generator capable of producing highly concentrated condensation aerosols. Study the effects of both the generator parameters and the physical properties of the liquid on the concentration and particle size of the aerosol produced.

   B.   Results: A new aerosol generating chamber was constructed and tested. The walls of the new chamber are porous, allowing more uniform cooling and mixing of the vapor as it is drawn into the chamber. As expected, the visibility of the aerosol produced by the generator was observed to be highly dependent upon the temperature and flow rate of the incoming vapor as well as the extent of dilution. Mark Alred and Woody Early (CAD) have completed the automation of the generator and integration with the light extinction instrumentation to be used to monitor the aerosols produced.